Overview

CPC's CO_2 sensor (P/N 210-2000) is a non-dispersive infrared analyzer designed for measuring environmental CO_2 concentration in ventilation systems and indoor spaces. Its measurement range of 0-2000 or 0-5000 ppm covers the range required to monitor compliance with ASHRAE and other ventilation efficiency standards.

An LCD display is available to provide local indication of CO_2 concentration and facilitate the setup and calibration process. An adjustable setpoint relay is available for direct control and alarm applications. Microprocessor-based digital electronics and a unique self-calibration algorithm improves long-term stability and accuracy
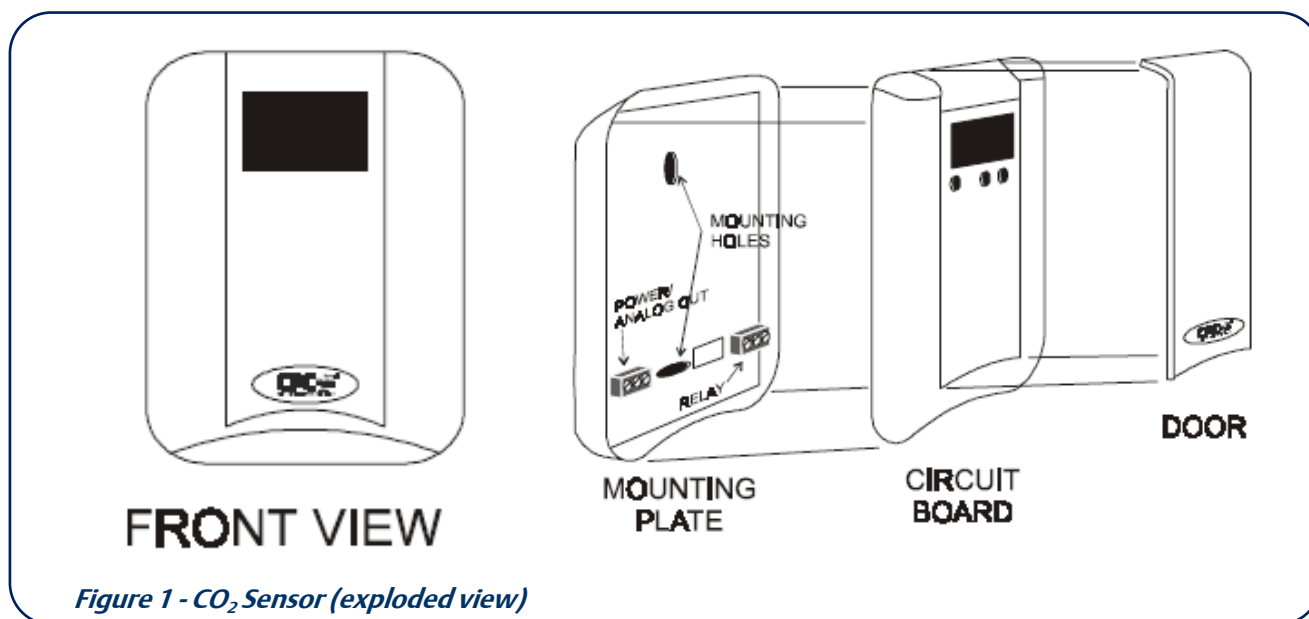
Mounting

Before mounting, remove the door from the circuit board by pressing a screwdriver against the locking tab on the top of the enclosure. Pry the circuit board away from the mounting plate using a screwdriver inserted into the two tab slots on the top of the enclosure.

Choose a location for the sensor with good air circulation, away from ventilation inlets, doors, windows, or other points where fresh air enters the room. The sensor should be mounted at least 4-1/2 feet above the floor. The environment temperature must be within 32°—112°F (0°—50°C).

If wiring will be coming in through the mounting plate from the back, punch out openings in the mounting plate and use the plate as a template for locating holes. Mount the mounting plate against a wall or other flat surface by using the two mounting holes and the screws provided (use wall anchors for drywall installations).

NOTE: Sensors must be mounted vertically (straight up and down) to ensure proper readings.

Figure 1 - CO_2 Sensor (exploded view)

Wiring

The mounting plate has two sets of three-terminal connectors. The connector on the left side of the mounting plate is where sensor power and the signal-to-I/O-board connection is made. The connector on the right side is where connection to the on-board relay is made.

Power Wiring

The CO_2 sensor requires 24VAC power from a non-center-tapped transformer. The sensor draws a maximum of 3VA power. CPC recommends P/N 640-0039, 10VA, 110VAC non-center-tapped Class 2 transformer.

Wire the transformer secondary to the connector on the left side of the mounting plate, as shown in Figure 2.

Analog Output Wiring

The middle terminal of the connector on the left side of the mounting plate is the analog output that communicates the current CO_2 concentration level to the site controller. This connector is typically connected to a point on an I/O board, such as a 16AI, 16AIe, or 8DO. Wire the middle (SIGNAL) terminal on the CO_2 sensor to the **even numbered** terminal of the I/O board point. Wire the COMMON terminal on the CO_2 sensor to the **odd numbered** terminal of the I/O board point. See Figure 2.

Relay Wiring

The CO_2 sensor has an on-board relay that changes state to indicate a CO_2 level higher that a programmed set point. This relay can be used as a digital input on an input board point, or it can be used to directly activate or deactivate an alarm annunciator or a device that controls ventilation.

The connector on the right side of the mounting plate is a Form C connector for the CO_2 sensor relay. Connect the input board point or device to the

middle (COMMON) terminal of this connector, and either the N.C. or N.O. terminal, depending on whether you want the relay to be OPEN or CLOSED when the CO_2 concentration is below the set point. See Figure 2.
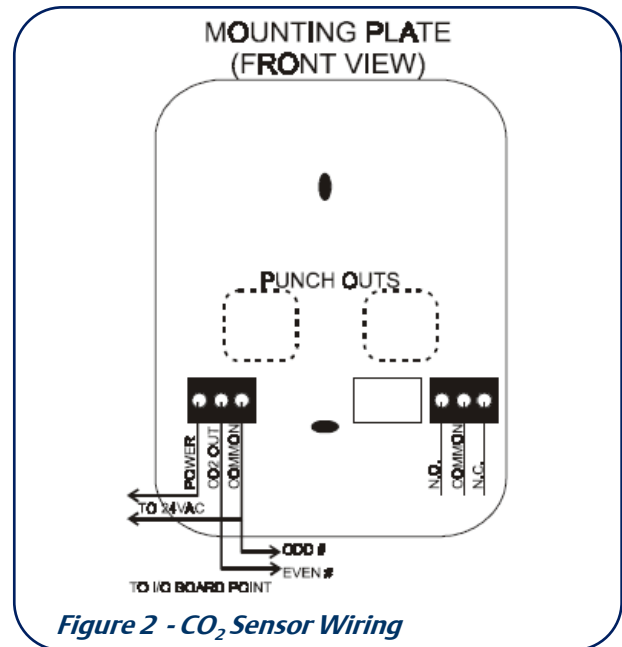

Figure 2 - CO_2 Sensor Wiring

Reassembly After Wiring

When you are finished wiring power and I/O to the connectors on the mounting plate, reconnect the circuit board to the mounting plate. Push the top end of the circuit board into the mounting plate so the two hooked tabs on the circuit board are underneath the tabs on the mounting plate. Then, gently press down on the bottom part of the circuit board until it snaps into place. See Figure 3.

If you have trouble pushing the circuit board in, check to see if the pins on the back of the circuit board are properly aligned with the power and relay connectors on the mounting plate. Also verify that there are no loose wires getting in the way.
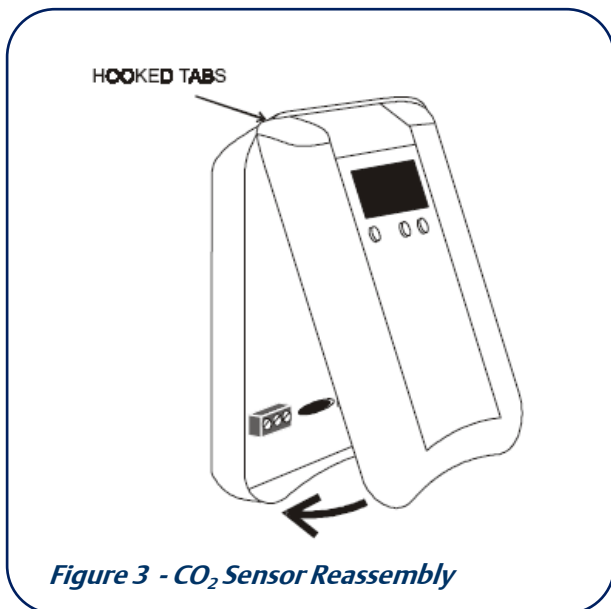
Figure 3 - CO_2 Sensor Reassembly

Setting the Volts/Amps Switch

The front of the circuit board has a switch that controls whether the analog output sends a signal as voltage (V) or milliamps (mA). To work with CPC I/O boards, this switch should be set to voltage (the DOWN position). Verify this switch is in the DOWN position before operating the sensor.

Setting Up the CO_2 Sensor Software

Before operating the sensor, you must use the LCD display and the three buttons on the front of the circuit board to set the sensor's operating parameters. Figure 4 shows the keys on the circuit board and the setup screens. Use the ENTER key to cycle through the setup screens, and the + and - keys to adjust parameter values.
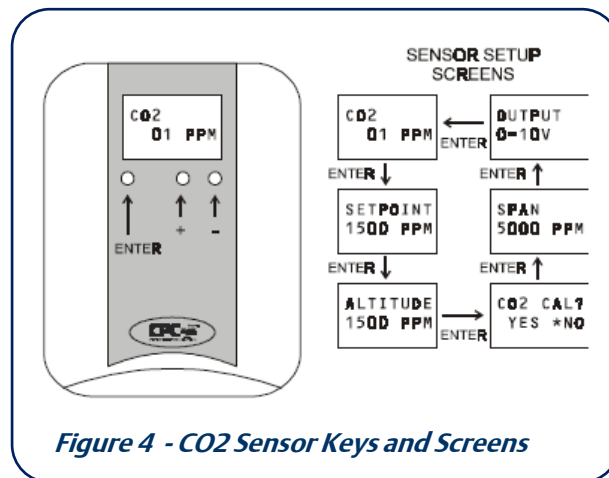

Figure 4 - CO2 Sensor Keys and Screens

Setpoint

If you are using the CO_2 sensor's relay for alarming or control, use the + and - keys to adjust the value of the set point. When the CO_2 sensor's reading is above this set point, the relay will energize. Press ENTER to save the setpoint value.

Altitude

To properly measure CO_2 concentrations, you must specify the approximate altitude of the site. Use the + and - keys to select the number of feet above sea level closest to the site's altitude. Press ENTER to save the altitude value.

CO_2 Calibration

*WARNING! Calibrating the CO_2 sensor requires a gas calibration kit. **DO NOT** perform a calibration without this kit, or else the sensor will give erroneous readings.*

All CO_2 sensors are shipped pre-calibrated, and will only require calibration once every five years to ensure proper readings. Calibration requires a special gas kit available from CPC. Follow the instructions that come with this kit to calibrate the sensor. Otherwise, press ENTER to bypass this screen and continue setup.

Span

The Span parameter determines whether you want to measure concentrations between 0-2000 ppm or 0-5000 ppm. If set to 2000 ppm, the sensor's analog output signal will be scaled properly so that the highest output voltage corresponds to 2000 ppm. Likewise, if set to 5000 ppm, the highest output voltage will signify 5000 ppm. Press ENTER to save settings.

Output

The Output parameter determines whether you want the analog output voltage to vary from 0- 5VDC or from 0-10 VDC. This parameter must be set to 0-5VDC if the analog output is connected to an I/O board's input point. Press ENTER to save settings.

Replacing the Door

Once all programming and wiring is done, the sensor is ready for operation. Snap the door on to the front of the circuit board to complete installation. The sensor comes equipped with two doors: one with a window that allows the screen to be shown, and one with no window that covers the screen. Choose whichever door is appropriate for your site.

Setting Up The Sensor Type in Einstein and REFLECS Controllers

The analog output of the CO_2 sensor is a linear 0-5VDC signal, with 0V representing a concentration of 0 ppm, and 5V representing the maximum concentration level (either 2000 ppm or 5000 ppm, depending on the value of the Span parameter you chose when setting up the sensor).

In order for Einstein and the REFLECS line of controllers (RMCC, BEC, or BCU) to read the signal from the CO_2 sensor, it must be set up under Sensor Control (for REFLECS) or the Analog Input Setup Screen (for Einstein) as a **Linear** sensor. Refer to your controller's user manual for more information on the Linear sensor type and how to program its parameters.

When setting up the sensor in Einstein or REFLECS, you will need to include the following information:

Gain: The Gain is the number that will be multiplied with the number of volts coming from the CO_2 sensor's analog output to yield the concentration value. If the sensor's Span is set to 5000 ppm, use a Gain value of 1000. If the Span is set to 2000 ppm, use a Gain value of 400.

Offset: Because all calibration is handled by the sensor itself, the CO_2 sensor's offset should be set to zero.

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